

1.1 Introduction to Biology

I Science of Life

A. Jane Goodall was successful in studying chimpanzees due to her patience and persistence. She was able to make critical observations about chimpanzees.

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B. ^{*}Biology - the study of life

1. When people study living things or pose questions about how living things interact with the environment they are learning about Biology.

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2. Biology studies the origins and history of living and once-living, the structures of living things, how living things interact with each other.

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5. Responds to stimuli:

a. Stimulus (Stimuli) - anything that is part of either the external or internal environment that causes some sort of reaction by the organism.

b. the reaction to a stimulus is the response.

c. Requires energy

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- a. living things get their energy from food
7. Maintains homeostasis- the regulation of an organism's internal conditions to maintain life
- example: Why do athletes need to produce more red blood cells in their body when they compete at higher altitudes?
- * less oxygen (O_2) available for athletes red blood cells to deliver to cells/tissues

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8. Adaptations evolve over time -
- a. Adaptation - is any inherited characteristic that results from changes to a species over time

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- 1 A (an) _____ is any part of an organism's environment that causes a reaction
- A species
 - B adaptation
 - C stimulus
 - D organization

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- 2 The process of natural changes that take place during an organism's life is called _____.
- A growth
 - B development
 - C response
 - D adaptation

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3 Drip-tip leaves allow plants to live in what kind of environment?

- A tropical
- B windy
- C cold
- D desert

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4 Which of these is not an example of the body maintaining homeostasis?

- A red blood cells delivering oxygen
- B emergence of evolutionary adaptation
- C lungs absorbing oxygen
- D insulin production in the pancreas

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5 Which of the following constitutes the basic structural organization of life?

- A weather conditions in a habitat
- B cell organelles that combine to form nuclei
- C species living in an environment
- D cells that make up tissues and structures

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1.2. The Nature of Science

→ Main idea: Science is a process
based on inquiry that develops
explanations

→ Review vocab: investigation -
a careful search or examination
to uncover facts

I. What is science?

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- A. Science is a body of knowledge based on the study of the natural world
 - 1. Science is in almost everything we do
- B. Scientific theory - an explanation of a natural phenomenon supported by many observations and experiments over time
 - 1. Two highly regarded theories in Biology: Cell theory and the theory of evolution
- C. Scientific Law - describes relationships under certain circumstances in nature

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- 1. Laws do not explain phenomena, just the "what" of their occurrence
- 2. Theories do not become laws, laws do not become theories
- D. Makes observations and draws conclusions
 - 1. Scientists make observations about a phenomena and draw conclusions from their observations

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- E. Expands Knowledge
 - 1. Most scientific fields are guided by research that results in a constant re-evaluation of what is known
 - a. Pseudoscience - areas of study that try to imitate science, but are driven by cultural or commercial goals
 - examples: astrology + tarot card reading

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- F. Challenges accepted theories
 - 1. Sciences advance by accommodating new information and questioning old information
- G. Questions results
 - 1. observations or data that are not consistent with current scientific understanding are of interest to scientists, which generally lead to more investigations
- H. Tests claims

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1. The use of data to test and support claims is one way to differentiate science from pseudoscience

I. Undergoes peer review

1. Peer review is a process by which the procedures and results of an experiment are evaluated by other scientists who perform similar research

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II Science in Everyday Life

- A. Science influences many occupations and fields of study

B. Science literacy

1. A person who is scientifically literate combines a basic understanding of science and its processes with reasoning and thinking skills
2. Ethics - a set of moral principles or values

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- a. Science touches on many ethical issues which require scientists to consider moral values during their research

example: genetic engineering
(cloning, etc.)

Review 1.2. Questions: 1, 3, 4, 6

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1.3. Methods of Science

→ Review Vocab: Theory:

an explanation of a natural phenomenon supported by observations and experiments over time

→ Main idea: Biologists use specific methods when conducting research

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I. Ask a Question

A. Scientific Inquiry begins with observation

1. Observation: a direct method of gathering information in an orderly way, often involves recording info.
2. Scientific inquiry involves asking questions and processing information from a variety of reliable sources
3. The process of combining what you know with what you have learned to draw conclusions is called inferencing

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a. the conclusions themselves are called inferences

B. Scientific Methods

1. Scientists use similar methods to gather information and to answer questions
2. These methods are referred to as Scientific methods

II Form a Hypothesis - a testable explanation of a situation or a natural phenomenon

III Collect Data

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A. Scientists perform experiments to obtain data

1. Experiment - an investigation of a phenomena in a controlled setting to test a hypothesis

B. Controlled Experiment

1. A control group is a group in an experiment used for comparing results to
2. Experimental group is the group exposed to the factor being tested

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C. Experimental Design

1. In a controlled experiment only one factor can change at a time

- a. Independent Variable - the factor that is manipulated during an experiment
- b. Dependent Variable - the factor that results from or depends on changes in the independent variable
- c. Constant - a factor that remains fixed during the experiment

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D. Data gathering

1. Data - information gained from observations
 - a. Data can be Quantitative (numerical) or Qualitative (descriptive)

E. Investigations

1. Scientists are constantly performing scientific inquiry

F. Metric System - uses units with divisions that are powers of 10

1. SI units - International System of Units
 - a. a universal scale used by scientists to perform measurements

→ Maze Lab (from p. 41)
Chapter 2: Lab write-up
due Tues 9/18

IV Analyze the data

- A. As Biologists look for explanations of data, patterns generally are noted that help explain data

1. Data can be displayed simply in a table, graph, or chart
2. Once data is analyzed, scientists may draw conclusions regarding the tested hypothesis

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V Report Conclusions

- A. Biologists report their findings and conclusions in scientific journals
 1. Peer-review - when scientists have their research findings judged by another scientist in their field

VI Student Scientific Inquiry

- A. This course will give you the opportunity to do your own investigations + experiments
- B. Remember Safety is critical

C. Lab Safety

1. Read and understand all lab + classroom safety rules

* If you don't know ASK

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